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DRYING MACHINE
[KANSOKI]

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Specification

1. Title of Invention

Drying Machine

2. Claim

1. A drying machine characterized as turning and driving a drum holding an object to be dried using a motor, supplying warm air to the abovementioned drum using a fan and drying the abovementioned object to be dried and provided with a regular mode operating course which turns and drives the abovementioned drum and at the same time drives the abovementioned fan as well as a drum stop mode operating course which drives the abovementioned fan in the abovementioned drum stop mode;

2. A drying machine characterized as turning and driving a drum containing an object to be dried using a motor, supplying warm air to the abovementioned drum using a fan and drying the abovementioned object to be dried and drying the abovementioned object to be dried and which is provided with a regular mode operating course wherein the abovementioned drum is turned and driven and at the same time, drives the abovementioned fan as well as a fan stop

mode operating course which turns and drives the abovementioned drum in the abovementioned fan stop mode.

3. Detailed Description of Invention

(Industrial Field)

The present invention relates to a drying machine wherein a drum containing the object to be dried is turned and driven by a motor, supplies warm air by using a fan inside the drum and drying the object to be dried.

(Prior Art)

In this type of conventional drying machine, the object to be dried inside the drum was picked up and untangled by carrying out operations such as turning and driving a drum and by driving the fan, the warm air was brought in contact with the entire object to be dried, thereby improving the drying efficiency.

(Problems Which the Present Invention is Intended to Solve)

However, in the abovementioned conventional configuration, the regular drum is turned during drying operations. As a result, when clothing which are easily damaged are dried as the object to be dried, this was

inconvenient as the clothing was damaged by the mechanical force occurring when the drum turned.

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Meanwhile, when shoes and the like were dried, a relatively small dedicated drying shelf was mounted inside in the center of the drum so that the shoes they would not be affected by the turning and drying was carried out while the drum turned with the shoes still mounted on the drying shelf. However, this had drawbacks in that stuffed toys and other comparatively large objects could not be mounted on the abovementioned drying shelf and consequently could not be dried.

Moreover, once the drying operations were completed, so-called “soft keep” operations were carried out to prevent lint from becoming attached to the clothing. However, in this case, although the drum was turned intermittently, when the drum was turned the fan was driven simultaneously. As a result, this had drawbacks in that the operating noise from the fan was considerably loud so that loud noises occurred intermittently and made the user uncomfortable.

Therefore, it is the first object of the present invention to provide a drying device which can dry not only the regular objects to be dried but clothing which is

easily damaged as well and at the same time to dry stuffed toys. Moreover, the second object of the present invention is to provide a drying machine which can reduce the operating noise during “soft keep” operations and can reduce to an absolute minimum any discomfort on the part of the user.

[Configuration of Invention]

(Means Used to Solve the Problems)

The drying machine in the first invention is characteristic in that it is provided with a regular mode operating course which turns and drives the abovementioned drum and which also drives the abovementioned fan and with a drum stop mode operating course which drives the abovementioned fan when the abovementioned drum is in stop mode, when the drum containing the object to be dried is turned and driven using a motor, warm air is supplied by a fan inside the abovementioned drum and the abovementioned object to be dried is dried.

Moreover, the drying machine in the second invention is characteristic in that it is provided with a regular mode operating course which turns and drives the abovementioned drum and drives the abovementioned fan and with a fan stop mode operating course which turns and

drives the abovementioned drum while the abovementioned fan is in stop mode, the drum which contains the object to be dried using a motor is turned and driven, warm air is supplied by a fan inside the abovementioned drum and the abovementioned object to be dried is dried.

(Actions)

When the abovementioned first invention is used, when the regular object to be dried is dried, the drum is turned and driven and at the same time the fan is driven in the regular mode operating course so that warm air is applied to the object to be dried evenly and drying is carried out efficiently. Meanwhile, when fragile clothing is dried, only the fan is driven in drum stop mode in the drum stop mode operating course and the clothing is dried by the warm air. As a result, in this case, the drum does not turn so that the clothing is not damaged. Moreover, even when relatively large stuffed toys are dried, if drying is carried out in the drum stop mode operating course, the drum does not turn so that the stuffed toys can be dried without falling off the drying shelf.

Moreover, when the second invention is used, when the regular object to be dried is dried, the drum is turned and driven and at the same time the fan is driven so that the

object to be dried is dried efficiently. Meanwhile, when “soft keep” operations are carried out, the fan stop mode operating course is executed and only the drum is turned and driven when the fan is in stop mode. As a result, loud noises not longer occur since the fan is not driven. As a result, the operating noise when “soft keep” operations are carried out can be reduced.

(Practical Embodiment of Invention)

Next, we shall describe a practical embodiment of the present invention referring to figures.

First, we shall explain the schematic configuration of the drying machine in Figure 2. 1 is an outer box. 2 is a drum which is placed inside outer box 1 and uses the interior as drying chamber 3. 4 is a fan chamber which does double duty as a heat exchange chamber which is placed at the rear of drum 2. 5 is a heat-exchange type two-blade fan placed so that the interior of the chamber is partitioned in this fan chamber 4. The air inside drum 2 is suctioned in the front side part of fan chamber 4 via a filter 6 from the rear of drum 2 as indicated by arrow A and is returned

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to the interior (drying chamber 3) passing through communicating duct 7. At the same time, the outside air is

discharged to the outside of the machine after being suctioned to the rear side of fan chamber 4 as indicated by arrow B. 8 is a heater which is placed on discharge part 7a of communicating duct 7. This is configured of four heaters 8a through 8d placed as indicated in Figure 5. The circulating current is heated for the inside of drum 2 by this heater 8. As a result, the warm air is supplied inside drum 2, that is, drying chamber 3. After this warm air is supplied for drying of the object to be dried, heat exchange is carried out in fan chamber 4 and it is dehumidified.

Moreover, 9 is a motor placed on the top of the inside part of outer box 1. A belt 10 is extended between pulley 9a placed on the rotation shaft of this motor 9, tension pulley 9b and the outer periphery of drum 2 so that drum 2 is turned and driven by motor 9. 11 is a fan motor placed on the rear side on the top part inside outer box 1. A belt 12 is extended between pulley 11a placed on the rotation shaft of this fan motor 11 and fan pulley 5a placed on fan 5 so that fan 5 is turned and driven by fan motor 11. 13 is a temperature sensor used to detect the temperature inside drying chamber 3. This is placed on discharging outlet 14a formed on fan casing 14 which makes up fan chamber 4. 15 is an electrode used to detect the amount of dry weight and

the degree of drying which is placed on a front fixed plate 16 which faces the inside of drum 2. This outputs electrical signals in accordance with the fabric resistance. Moreover, 18 is a circuit substrate placed on the front side on the upper part inside outer box 1 and an operating control circuit (see Figure 3) (to be discussed further on) is mounted on this circuit substrate 18. 19 is an operating panel placed on the top part of the front surface of outer box 1.

In Figure 4 which indicates this operating panel 19. 20 is a power switch. 21 is a start switch. 22 is a course switching switch which switches between the [standard] course and the [cautious] course. 23 is a heater switching switch used to switch between strong and weak for heater 8. 24 is a drum stop switch used to set the drum stop mode which is the drying operation used to drive fan 5 when drum 2 is in stop mode. 25 is a timer setting switch used to set or change the timer time. Moreover, 26 through 34 are light emitting diodes used to display each of the setting contents. Light emitting diodes 26, 27 are [standard] course and [cautious] course. Light emitting diodes 28, 29 indicate [strong] and [weak] for heater 8. Light emitting diode 30 indicates the drum stop mode. Light emitting diodes 31 through 34 indicate timer time of [30 minutes],

[60 minutes], [90] minutes and [180 minutes]. In this case, when power switch 20 is operated, light emitting diodes 26 and 28 light up. When the abovementioned course switching switch 22 is operated, light emitting diodes 26 and 27 both light up every time the switches are operated. Meanwhile, when drum stop switch 24 is operated, light emitting diodes 26 and 27 go out and at the same time, light emitting diodes 30 and 31 light up. When drying operations are carried out in this setting mode, drying detection is not carried out and drying operations for [30 minutes] in drum stop mode are carried out. Timer switch 25 is operated to change this operating time. When this switch is operated, light-emitting diodes 31 through 34 flash on and off in that order, starting from diode 31 and continuing on through diode 34. Moreover, when timer setting switch 25 is operated without operating drum stop switch 24, light-emitting diodes 26 and 27 go out. At the same time, light-emitting diode 31 lights up. When drying operations are carried out in this setting, drying detection is not carried out and drying operations for [30 minutes] are carried out in drum stop mode. Timer setting switch 25 is operated to change the operating time. When this switch 25 is operated, light emitting diodes 31 through 34 light up in that sequence. Moreover, when timer switch 25 is

operated without operating drum stop switch 24, light emitting diodes 26 and 27 go out and at the same time, light emitting diode 31 flashes on and off. When drying operations are carried out in this setting mode, drying detection is not carried out and drying operations for the usual mode are carried out for [30 minutes] in regular mode. The abovementioned timer setting switch indicated above is operated to change the operating time.

Next, in Figure 3 which indicates the electrical configuration, 35 is a microcomputer which is an operating control circuit and is provided with a program used to control operations. This microcomputer 35 is provided with clock pulses from clock pulse generation circuit 36, detection signals from temperature sensor 13 and electrode 15 as well as switching signals from input switch circuit 37 which is provided with the abovementioned switches 20

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through 25. The abovementioned microcomputer 35 electrifies and cuts the electricity for motor 9, fan motor 11 and heater 8 via drive circuit 38. Further, 39 is a display device provided with the abovementioned light emitting diodes 26 through 34. 40 is an alternating current power source. 41 is a rectifying circuit used to apply direct current power source voltage in microcomputer 35.

Next, we shall explain the actions for the abovementioned configuration referring to Figure 1 and Figure 6. Figure 1 is a schematic flow chart indicating the contents for the operation control program. In Figure 1, first of all, the regular mode operating course which is applied when drying clothes and the like which are the usual objects to be dried, that is, the operations which turn and drive drum 2 and at the same time fan 5. In this case, when starting switch 21 is operated, drum stop mode is not set so that we proceed to [NO] in Step S1 and heater 8, motor 9 and fan motor 11 are electrified (Step S2). As a result, drum 2 is turned and driven and at the same time, fan 5 is turned and driven. At this time, warm air which is heated by heater 8 is supplied inside drum 2. Then, the abovementioned operations are continued (Step S3) until the drying detection is carried out. After this, when drying detection is carried out, the electricity for heater 8 is cut off (Step S4) and drum 2 and fan 5 are turned for 5 minutes in this state. Then, the electricity for motor 9 and fan motor 11 is cut off and drying operations are completed (Step S5, Step S6). Next, so-called “soft keep” operations are carried out. Here, the fan stop mode operation course, that is, the operations for drum 2

turning and driving are carried out when fan 5 is stopped. Specifically, motor 9 is electrified intermittently while the electricity for fan motor 11 is cut off (for example, electrification is carried out for 10 seconds out of the two minutes and operations for the remaining electricity cutoff time are repeated) (Step S7). Then, the abovementioned intermittent electrification is carried out (Step S8) until 3 hours have elapsed). After this, when 3 hours have elapsed, the electricity for motor 9 is cut off and “soft keep” operations are completed (Step S9).

Meanwhile, we shall explain the drum stop mode operation course which is applied when clothes or stuffed toys which are fragile are dried, that is, operations for driving fan 5 when drum 2 is stopped. In order to carry out these operations, drum stop switch 24 is operated in advance before starting and drum stop mode is set. At this time, time setting switch 25 is operated and the timer time is set for the operating time. Moreover, when the clothes are placed inside drum 2, a double-fold type shelf 42 indicated in Figure 6 is placed so that it extends in a straight line as indicated in Figure 6 in drum 2. In this case, shelf 42 is placed inside drum 2 while folded in two so that it extends in a straight line so that the state indicated in Figure 6 is reversed and the up and down

directions are reversed. Then, the clothes and others are loaded in this shelf 42. Then, when starting switch 21 is operated, the drum stop mode is set so that we proceed to [YES] in Step S1 and heater 8 and fan motor are electrified (Step P10). As a result, fan 5 is turned and driven when drum 2 is in stop mode. At this time, warm air which has been heated in heater 8 is supplied inside drum 2. Here, when heart 8 is set to [WEAK], heater 8c and heater 8d are electrified as indicated in Figure 5 and heater 8a and heater 3b are electrified. This means that the warm air does not make direct contact with the clothing and others on shelf 42. Further, when heater 8 is set to [STRONG], heaters 8a through 8d are all electrified. Then, the abovementioned operations are continued until the set timer time has elapsed (Step S11). After this, when the timer time has elapsed, electricity to heater 8 is cut off (Step S12). After fan 5 has been turned and driven for 5 minutes in this state, the electricity to fan motor 11 is cut off and drying operations are completed (Step S13, Step S14).

According to the practical embodiment of this type of configuration, when the regular objects to be dried are dried, drum 2 is turned and driven in the regular mode operating course and fan 5 is driven. As a result, the warm air makes total contact with the object to be dried so that

the object to be dried is dried efficiently. Meanwhile, when fragile clothing is dried, only fan 5 is driven when

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drum 2 is in stop mode and the clothing is dried by the warm air. As a result, in this case, drum 2 does not turn so that the clothing is not damaged. Moreover, if drying is carried out in the drum stop mode operating course even for stuffed toys, the drum will not turn. As a result, drying can be carried out without the stuffed toys falling from the shelf even if they make contact with drum 2. Moreover, when “soft keep” operations are carried out, the fan stop mode operating course is carried out and only drum 2 can be turned and driven when fan 5 is in stop mode operating course. As a result, loud noises are not emitted from fan 5 since fan 5 is not driven. As a result, the operating noise when “soft keep” operations are carried out can be reduced. Since these small operating noises occur only intermittently, any discomfort caused to the user is kept to an absolute minimum.

Further, in the abovementioned practical embodiment, heater 8 is set to {WEAK} in the drum stop mode operating course and only heaters 8c and 8d are electrified. As a result, warm air does not make direct contact with the clothing and others on shelf 42 and even clothing which is

fragile when heated can be dried. Moreover, shelf 42 is configured so that it is the double-folding type so that it can be easily mounted onto and removed from drum 2 and the shape of shelf 42 can be increased.

In addition, in the abovementioned practical embodiment, drum 2 and fan 5 are driven respectively by two motors, motor 9 and motor 11. However, it should by no means be construed that the embodiments are restricted to this and the drum and fan may be driven respectively by a single motor via an electromagnetic clutch and the like.

[Effect of Invention]

The present invention is as described previously and has the following effects.

In the drying device as indicated in Claim 1, besides the regular objects to be dried, clothing which is fragile can also be dried and at the same time, stuffed toys and other objects which are relatively large can be dried.

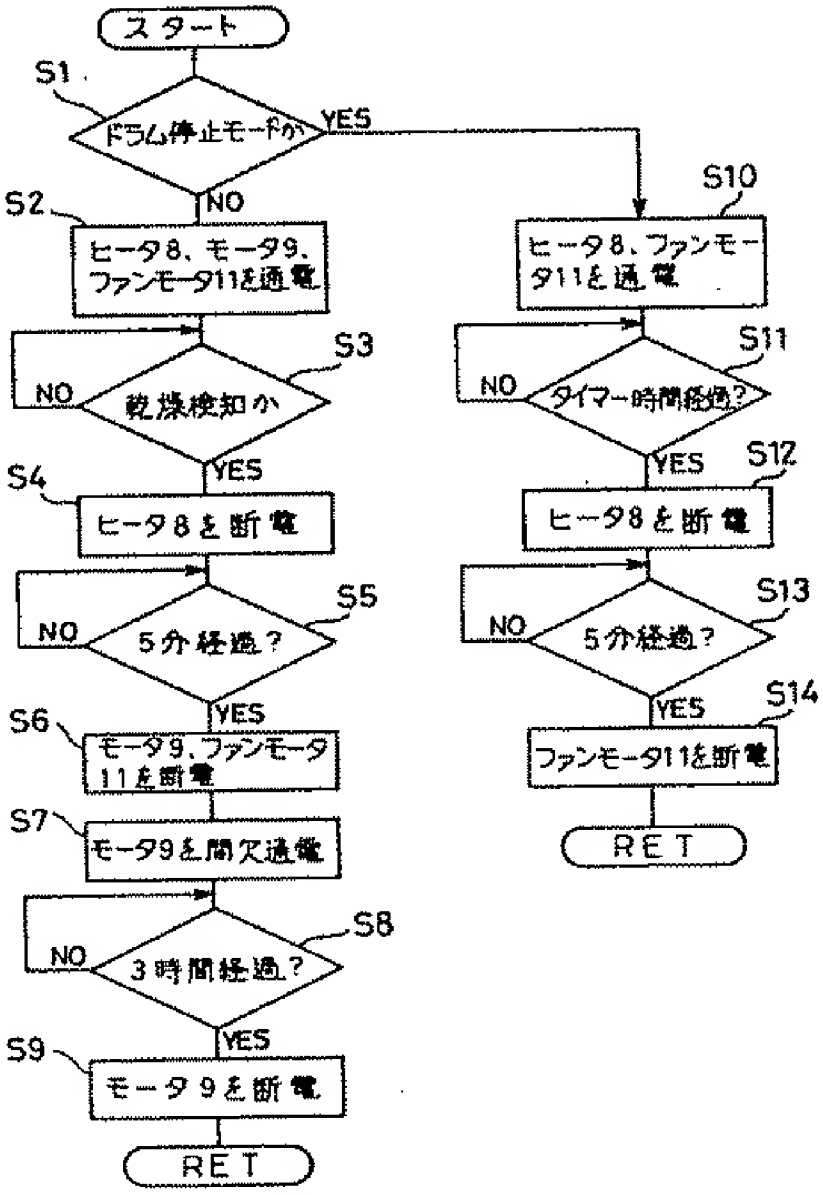
The drying device as indicated in Claim 2 is provided with a configuration fan stop mode operating course which turns and drives the drum in fan stop mode so that operating noises during “soft keep” operations can be

reduced and any discomfort caused the user can be kept to a minimum.

4. Brief Explanation of Figures

The figures indicate a practical embodiment of the present invention. Figure 1 is a flow chart. Figure 2 is a vertical sectional view of the entire body. Figure 3 is an electrical configuration diagram. Figure 4 is a frontal view of the operating panel. Figure 5 is a vertical sectional view of the front side inside the drum. Figure 6 is an inclined view of the shelf.

In the figure, 2 is a drum; 5 is a fan; 9 is a motor; 11 is a fan motor; 19 is an operating panel; 35 is a microcomputer; 42 is a shelf.



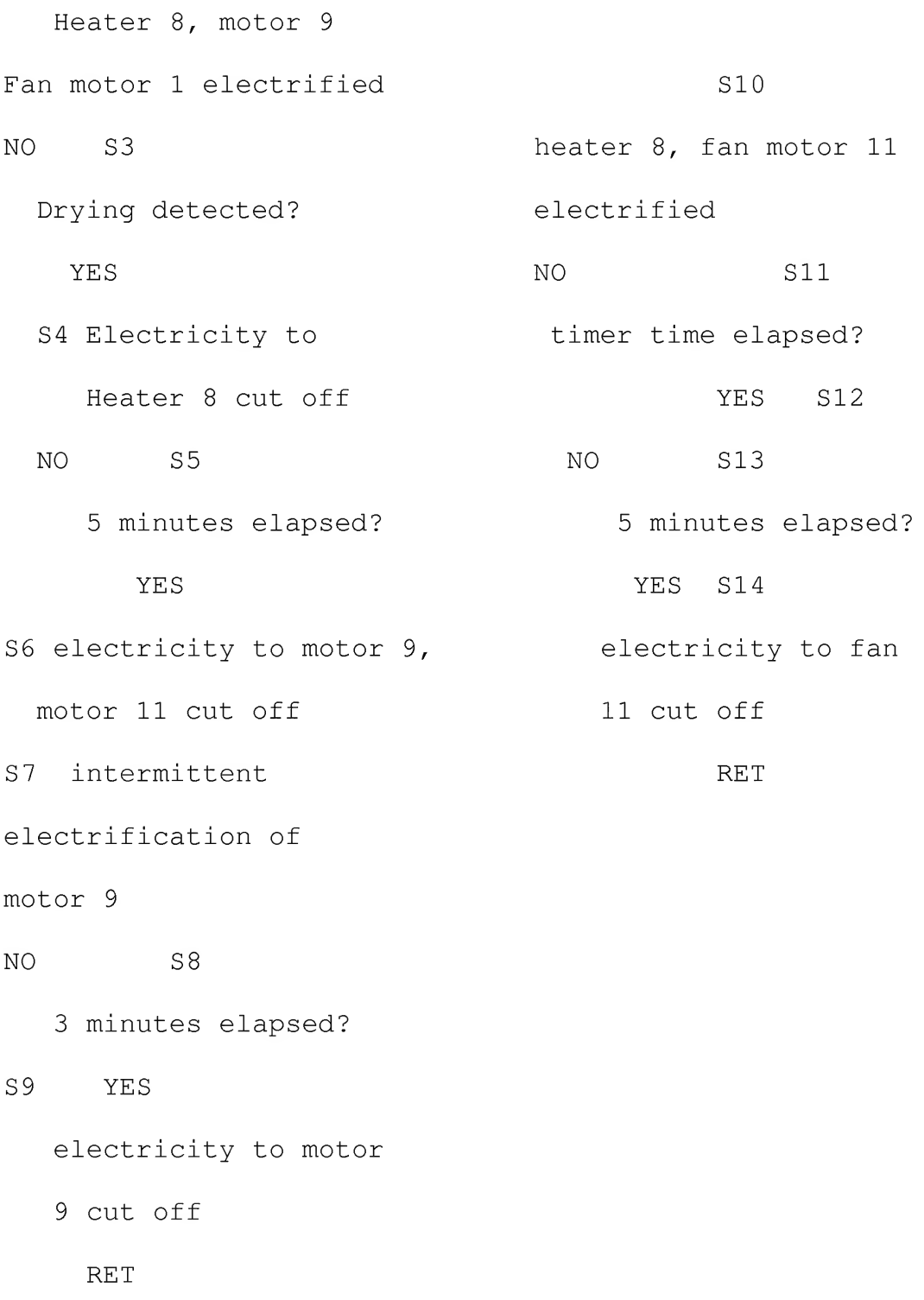
第 1 図

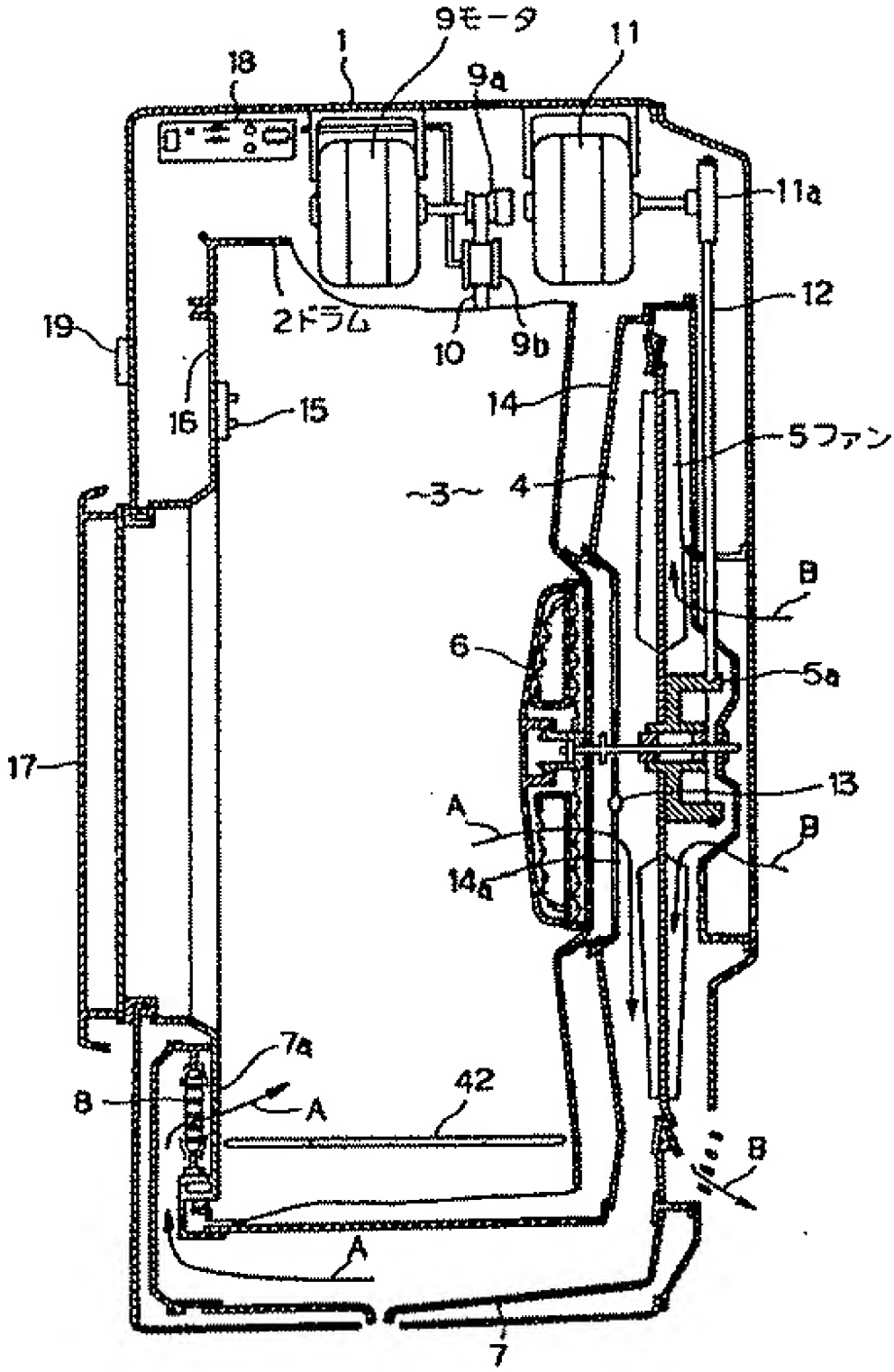
Figure 1

START

S1 drum stop mode YES

S2 NO


Heater 8, motor 9
Fan motor 1 electrified
NO
S3
Drying detected?
YES
S4 Electricity to
Heater 8 cut off
NO
S5
5 minutes elapsed?
YES
S6 electricity to motor 9,
motor 11 cut off
S7 intermittent
electrification of
motor 9
NO
S8
3 minutes elapsed?
S9
YES
electricity to motor
9 cut off
RET
S10
heater 8, fan motor 11
electrified
NO
S11
timer time elapsed?
YES
S12
NO
S13
5 minutes elapsed?
YES
S14
electricity to fan
11 cut off
RET


9モータ
1
18
9a
11
11a
12
2ドラム
10
9b
19
16
15
14
5ファン
3
4
B
6
5a
17
13
A
14a
7a
8
42
7

第 2 図

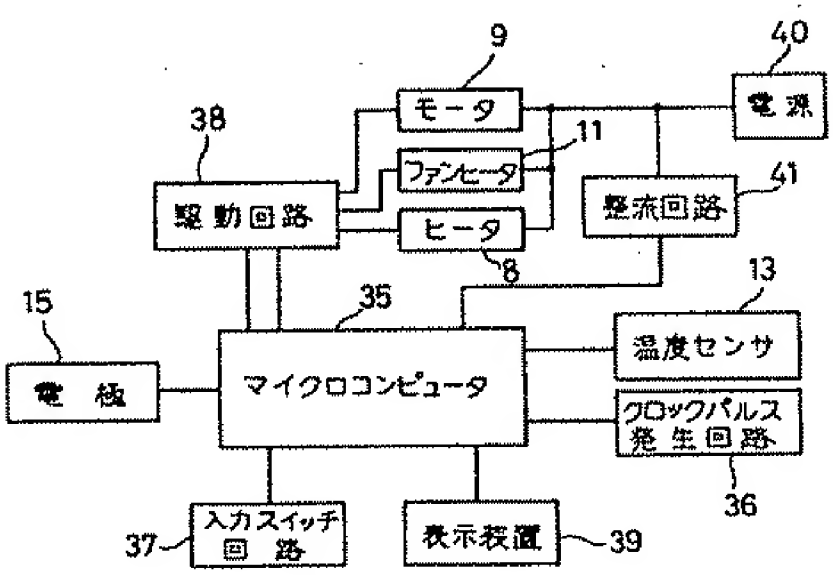
[Figure 2]

[captions:

9: motor

2: drum

5: fan

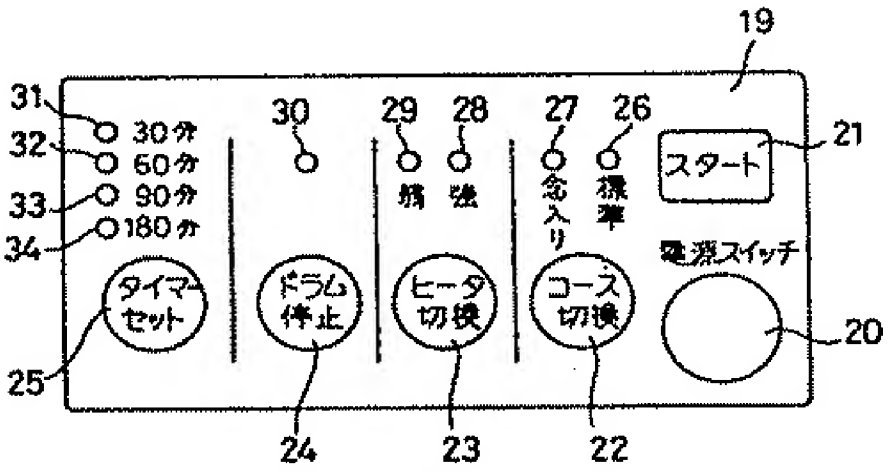


第 3 図

[Figure 3]

[captions:

8: heater; 9: motor; 11: fan motor; 13: temperature sensor; 15: electrode; 35: microcomputer; 36: clock pulse generation circuit; 37: input switch circuit; 38: drive circuit; 39: display device; 40: power source

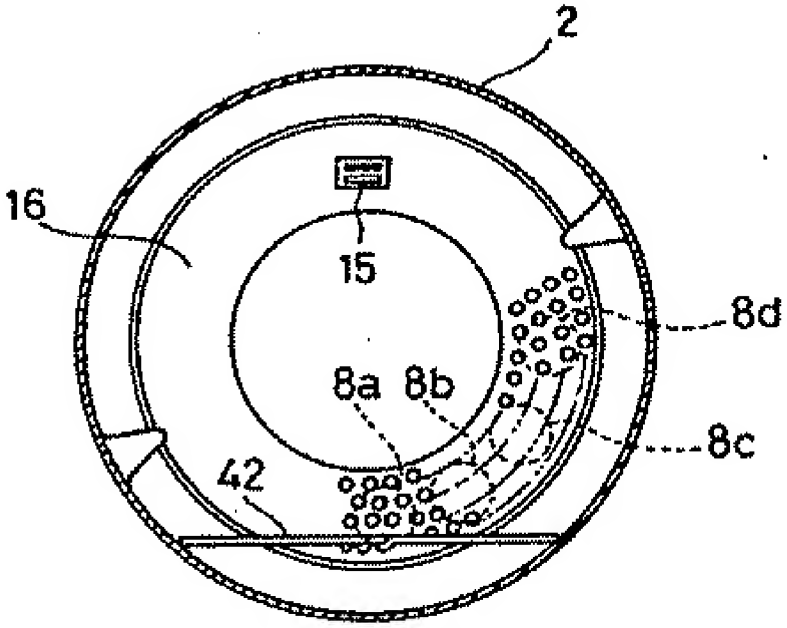


第 4 図

[Figure 4]

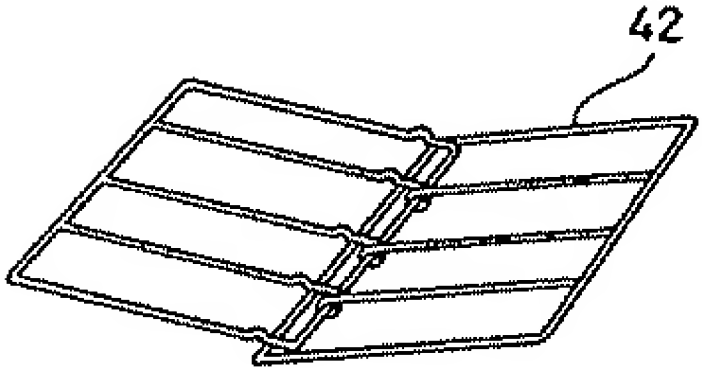
[captions:

20: power source switch; 21: start; 22: course switch; 23: heater switch; 24: drum stop; 25: timer set; 26: standard; 27: caution; 28: strong; 29: weak.



第 5 図

[Figure 5]



第 6 図

[Figure 6]